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A REPORT ON THE EXHAUST EMISSIONS OF AN ARMY M-151 1/4 TON TRUCK USING AN EXHAUST CATALYST

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National Air Pollution Control Administration
Ann Arbor, Michigan

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16. Abstracts

A standard Army 1/4 ton M-151 vehicle was tested for exhaust emissions before and after installation of an Englehart Model PTX catalytic exhaust reactor. This vehicle uses a 141 cubic inch, inline, four cylinder engine and requires an inertia weight of 3000 pounds. The vehicle was tested prior to installation of the reactor and with the reactor installed as follows: (1) the 1972 Federal test procedure using the LA4-S3 driving cycle (LA4); (2) standard 1970 Federal test procedure for exhaust emissions (FTP); (3) closed, constant volume sampling technique using 9 repeats of the 7-mode Federal emissions test cycle (CVS). The results, which are tabulated, indicate that there is a slight (22%) improvement in unburned hydrocarbons with the reactor, that carbon monoxide increased slightly (15%) with the reactor, and that oxides of nitrogen are moderately reduced (41%) with the reactor.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Exhaust emissions
Trucks
Military vehicles
Catalytic converters
Tests
Sampling
Nitrogen oxides
Carbon monoxide
Hydrocarbons

17b. Identifiers/Open-Ended Terms

1972 Federal Test Procedure (LA4)
1970 Federal Test Procedure (FTP)
Constant Volume Sampling Technique (CVS)

17c. COSATI Field/Group 13B

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Vehicle Tested

A standard Army 1/4 ton M-151 vehicle was tested for exhaust emissions before and after installation of an Englehart Model PTX catalytic exhaust reactor. This vehicle uses a 141 cubic inch, inline, four cylinder engine and requires an inertia weight of 3000 pounds. For these tests the reactor was installed in place of the standard muffler with an auxillary air line provided to supply air for the reactor. The air was supplied by a shop air system and flow was maintained at 2 cubic feet per minute.

Tests Conducted

Baseline Tests

The vehicle was tested prior to installation of the reactor and with the reactor installed as follows:

1. The 1972 Federal test procedure using the LA4-S3 driving cycle (LA4).

2. Standard 1970 Federal test procedure for exhaust emissions (FTP).

3. Closed, constant volume sampling technique using 9 repeats of the 7-mode Federal emissions test cycle (CVS).

Closed cycle data were taken as proscribed in the 1972 Federal procedure for both the LA4 and the CVS tests. The Whittaker "NOx Box", an electro-chemical device, was used for determination of oxides of nitrogen in the CVS sample, and non-dispersive infrared was used during the FTP.

Emission Results

Table 1 shows a comparison between the vehicle as received and as equipped with an exhaust reactor using the 1972 Federal procedure. This shows an increase in carbon monoxide with reduction in hydrocarbon and oxides of nitrogen. A complete listing of all tests is shown in table 2. The greatest reduction in emissions between standard and the reactor is shown on the 1970 Federal test (FTP). One reason for this effect is due to the emphasis on the hot portion of the FTP where the reactor is at its best.

All tests results are shown in grams per mile.

Conclusions

1. There is a slight (22%) improvement in unburned hydrocarbons with the reactor.

2. Carbon monoxide increased slightly (15%) with the reactor.

3. Oxides of nitrogen are moderately reduced (41%) with the reactor.

TABLE 1

1972 Federal Test Procedure

	As Received	Reactor
Hydrocarbons	6.6	5.2
Carbon Monoxide	65	75
Oxides of Nitrogen	3.9	2.3

All Results are Reported in Grams Per Mile.

TABLE 2

M-151 Test Data October and November 1970

Mileage	Test		HC	CO	CO2	NOx
		Baseline				
14997	LA4		6.4	76	481	3.4
15005	9X7	FTP	6.4	32	---	2.0
		CVS	9.8	68	395	2.3
15024	LA4		5.2	51	539	4.5
15031	LA4		7.3	68	495	3.8
		Rich Adjustment of Carburetor				
15043	9X7	FTP	4.9	74	---	2.1
		CVS	7.9	86	379	3.2
15051	LA4		7.7	111	386	3.4
		Reactor - 2 SCFM Aux. Air				
15064	9X7	FTP	1.5	39	---	1.2
		CVS	3.1	65	477	1.9
15071	9X7	FTP	1.6	33	---	1.6
		CVS	4.1	64	488	2.2
15078	LA4		4.8	85	541	2.7
15087	LA4		5.6	66	489	1.9

All Results Reported in Grams Per mile